BASIK FORMULAS

$\frac{40}{625}$ $\frac{8}{105}$

.6
.4
.24

$x^3-y^3=\cancel{(x-y)(x^2\cdot y)}$

x^3-4x^2

$x^3+px+q=0$

6 | 2 -5 -46 +24
12 42 -24
2 7 -4 0

$(x-6)(2x^2+7x-4)$
$(2x-1)(x+4)$

$x=\sqrt[3]{-\frac{q}{2}+\sqrt{\frac{q^2}{4}+\frac{p^3}{27}}}+\sqrt[3]{-\frac{q}{2}-\sqrt{\frac{q^2}{4}+\frac{p^3}{27}}}$

+40

quadratic: $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

-8 | 1 8 -3 -24
-8 0 24
1 0 -3 0

$x^3+b=(x+\sqrt[3]{b})(x^2+x+1)$ $x^3+1=(x-1)(x^2-x+1)$

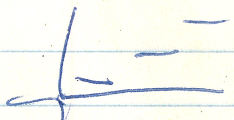
$a^3-b^3=(a-b)(a^2+ba+b^2)$ $a^3+b^3=(a+b)(a^2-ba+b^2)$ / $x-c$ ∴ c is factor and x int

4 | 6 -19 25 +18 8
24 20 -20 8
6 5 -5 -2 0

$-\frac{1}{3}$ | 6 5 -5 -2
-2 -1 +2
6 3 -6 0

$\frac{3x^2+4x-1}{x-1} \rightarrow$ 1 | 3 4 -1
3 7
$3x+7+\frac{6}{x}$ remain

STEP FUNK



$y=[x]$
INT( )

$6x^2+3x-6$
$3(2x^2+x-2)$
~~3(2x)(x~~)

$x-2\overline{)x^3+0x^2+0x-8} \rightarrow$ 2 | 1 0 0 -8
x^2 2 x2 4 x4 8
2 4 OR $=1x^2+2x+4$

USE b^2-4ac discriminate

-3 | 1 -8 0 -1
-3 33 -99
1 -11 33 -100

1 | 1 0 2 4 1
1 3
1 1 3 7 8

b0ab 61

remainder of $\frac{P(x)}{x-c}=P(c)$

binomial $r_1+r_2=\frac{-b}{a}$ $r_1r_2=\frac{c}{a}$

trin $r_1+r_2=\frac{-b}{a}$ $r_1r_2+r_2r_3+r_3r_1=\frac{c}{a}$ $r_1r_2r_3=\frac{-d}{a}$

2aa

$ax^2+bx+c=0$ roots are x-int c=yint

1 at a time = 2nd coef, 2 at time =

$r_1+r_2+r_3=\frac{-b}{a}$ $r_1r_2+r_2r_3+r_1r_3$...

$|a+bi|=\sqrt{a^2+b^2}$

$c^2=a^2+b^2-2ab\cos C$

$\frac{3}{2}\big|\ 10\ \ {-2}\ \ 5$
$1\ \ \frac{3}{2}\ \ \frac{9}{4}\ \ \frac{3}{8}$
$\frac{3}{2}\ \ \frac{3}{4}$

R. ROOT
RATIONAL ROOT

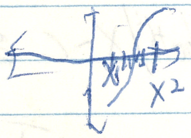
RATIONAL ROOT TEST – p/q is a root –
q | lead coef, p | constant ° $x^3-6x^2+11x-6=0$
p | -6 roots = (±1, ±2, ±3, ±6)
q | 1

If DIVIDE BY + # and all quotient is non-neg, reached upper bound

IF DIVIDE BY -# and all quotient alternates + - + -, reached lower bound

$\sin(A-B) = \sin A\cos B - \cos A\sin B$
$\cos(A-B) = \cos A\cos B + \sin A\sin B$
$\cos(A+B) = \cos A\cos B - \sin A\sin B$
$\sin(A+B) = \sin A\cos B + \cos A\sin B$
$\sin\frac{s}{2} = \pm\sqrt{\frac{1-\cos s}{2}}$
$\cos\frac{s}{2} = \pm\sqrt{\frac{1+\cos s}{2}}$
$\tan\frac{s}{2} = \frac{\sin s}{1+\cos s}$

Location Theorum



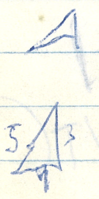
← ZERO IN

x_1 | | ⓪ | | x_2

$x^3-2x^2+x-1=0$
$\underbrace{+\ \ -\ \ +\ \ -}$
3 + reals
1 + reals

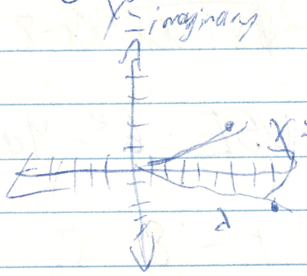
$4x^3-10x^2+25x+4=0$ neg
$\underbrace{+\ \ -\ \ +}\ \ +$
2 + reals
0 + reals

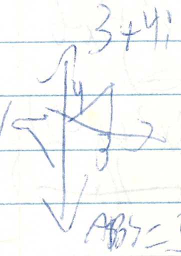
-- $+_2$
1 - real



$6+2i = x+12yi$
$6=x$
$12y=2$

$6+2i\ \boxed{<}\ 8\ 2i$





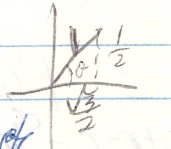
ABS = 5
ABS(3+4i) = 5

ABSOLUTE VALUE = Distance from 0

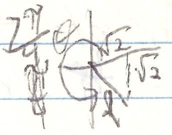
$a+bi = r\cos\theta + i\,r\sin\theta$

$z = \frac{\sqrt3}{2}+\frac12 i$ $r=1$ $\theta=\frac{\pi}{6}$

60 $\frac{\sqrt3}{2}+\frac12 i$
$-\frac{\sqrt3}{4}i + \frac14$



$z=\sqrt2-\sqrt2 i = 2(\cos\frac{\pi}{4} + \sin\frac{7\pi}{4} i)$



$-3i$

$z_1 = r_1(\cos\theta_1 + i\sin\theta_1)$ $z_2 = $ etc

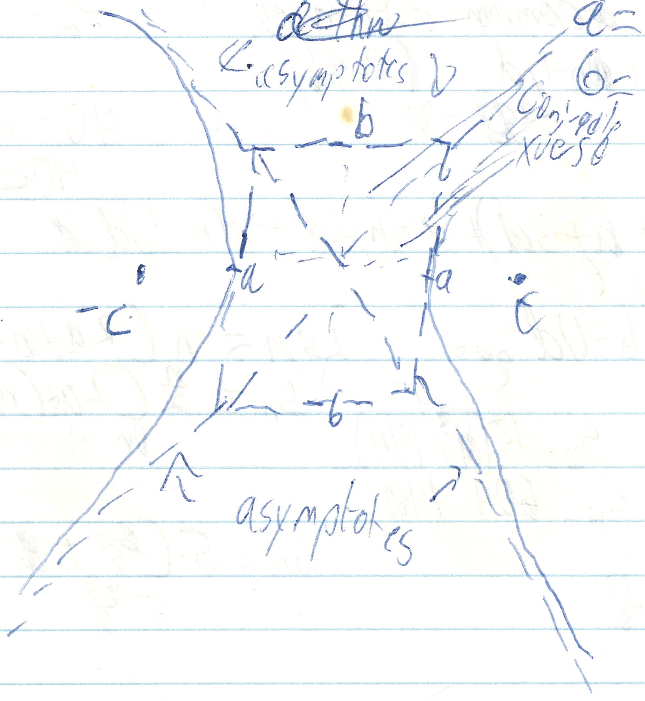
$z_1z_2 = (r_1(\cos\theta_1 + i\sin\theta_1))(r_2(\cos\theta_2 + i\sin\theta_2))$
$= r_1r_2(\cos\theta_1\cos\theta_2 + i\cos\theta_1\sin\theta_2 + i\sin\theta_1\cos\theta_2 + i^2\sin\theta_1\sin\theta_2)$
$r_1r_2(\cos\theta_1\cos\theta_2 - \sin\theta_1\sin\theta_2) + i(\sin\theta_1\cos\theta_2 + \cos\theta_1\sin\theta_2)$
$r_1r_2(\cos\theta_1+\theta_2) + i(\sin\theta_1+\theta_2)$

$\frac{z_1}{z_2} = \frac{r_1}{r_2}(\cos\theta_1-\theta_2) + i(\sin\theta_1-\theta_2)$

77
49
66

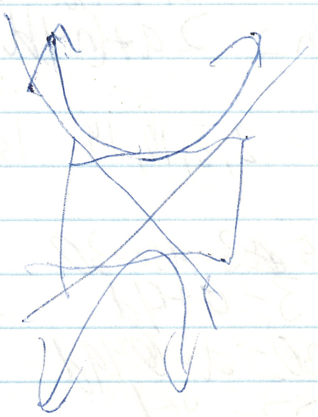
50000 ~~002~~
~~1000~~

Hyperbola x and y varie inversely $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ hyperbola @ center



a = transverse axis c = foci
b = conjugate axis $c^2=a^2+b^2$

eccentricity = $\frac{\pm c}{a}$
asymptotes = $y=\frac{\pm b x}{a}$



~~$\frac{y^2}{a^2}\frac{x^2}{b^2}$~~
$\frac{y^2}{a^2}-\frac{x^2}{b^2}$

asymp = $y \pm \frac{a}{b}$

PARABOLA LINE + POINT EQUIDISTANT

$y=\frac{-b}{2a}$ axis of symmetry
$y=ax^2+bx+c$

$3x-4y=12$ $3x-4y-12=y$
~~$3x\ 3y\ 42$~~

~~$x^2-8x-9=0$~~ $x^2-8x+16+y^2-6y+9=9+9+16$
$(x-9)(x+1)=0$
$x=9$ $x=-1$

SEQUENCES Fibonacci sequences: 1, 1, 2, 3, 5, 8, 13 (add prev. 2) recursive

Sigma $\sum_{k=x}^{n} ka$

k → dummy variable
x thru n of ka,
a → formula w/ n.

sum of all #s

$\sum_{j=1}^{5}(a_{j+1}-a_j)$ collapsing (telescoping) series.
$(a_2-a_1)+a_3-a_2+a_4-a_5+a_6-a_5=a_6-a_1$

131072
262144

$40 = a$
$-2 = a + 4d$
$d = -a - 2$
$40 = a + (-a-2)d$
~~$40 = a + 4d\ 2d$~~

ARITHMETIC PROGRESSION sequences that are made by ~~a~~ common differences.
nth term → $a_n = a_1 + (n-1)d$ (out!)

-88

$S_n = a + (a+d) + (a+2d) + (a+3d) + a + (n-2)d + a(n-1)d$
$S_n = a + (n-1)d + a + (n-2)d + C$
$S_n = 2a + (n-1)d + 2a + (n-1)d$ geo

$2S_n = n(2a + (n-1)d)$
$S_n = \frac{n}{2}(2a + (n-1)d)$
Or $S_n = \frac{n}{2}(a + a_n)$

2, 6, 10, 14 1st 30
$S_{30} = 15(4 + 144)$
$S_{30} = 60 + 1460$

$a_5 = 3$ $a_{50} = 30$
$S_{10} = ?$
$3 = a + 4d$
$\frac{15}{5} 3 = a + \frac{12}{5}$
$30 = a + 49d$
$\frac{3}{5} = a$
$27 = 45d$
$3 = 5d$ $d = \frac{3}{5}$

$S_{10} = 5\left(\frac{6}{5} + \frac{27}{5}\right)$
$5\frac{33}{5}$
33

GEOMETRIC RATIO COMMON RATIO $1, 2, 4, 8, 16 \ldots$ $\frac{2}{1} = \frac{4}{2} = \frac{8}{4} = \frac{16}{8}$ $a_n = ar^{n-1}$

$a_1 = 9$ $a_3 = 4$ $a_2 = x$
$\frac{x}{9} = \frac{4}{x}$ $x^2 = 36$ $x = 6$
$729 = 1458$
$\frac{823}{1024}$

$64r^6 = 8000$
$16r^6 = 2000$
$4r^3 = 500$
$r^3 = 125 = 5$

$S_n = a + ar + ar^2 \ldots ar^{n-1}$
$-(rS_n = ar + ar^2 + ar^3 \ldots ar^n)$
$S_n - rS_n = (a - ar^n)$
$S_n(1-r) = a(1-r^n)$
$S_n = \frac{a(1-r^n)}{1-r}$

$\frac{4}{3}$
$\frac{5}{7}$

$1024 \cdot 7 = 7168$ $512 = 3584$

$\frac{\frac{1023}{1024}}{\frac{1}{2}} = \frac{1023}{1024}$

$n = \infty$ $\frac{1}{2^n} = 0$
for frac. $S_\infty = \frac{a}{1-r} = 1$ n cancels out

$\frac{2}{3} / \frac{4}{3} = \frac{1}{2}$

$\frac{2}{3} / -\frac{3}{3} = -\frac{2}{5}$

$\frac{4(1-1024)}{3}$ $\frac{4092}{3}$
$\frac{35}{280}$
1364

BINOMIAL EXPANSION $(a+b)^x =$ $a^{x-(n-1)}b^{n-1}$
nth term

PASCAL'S TRI $10(8 + 272) = 2800$

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1